

Chapter 8

Quality Assurance

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[Editors note: During 2005, responsibility for the environmental Quality Assurance (QA) program was divided among three groups—the Environmental Monitoring Laboratory (EML), the Environmental Permitting and Monitoring group (EPM), and the Geochemical Monitoring group (GM)].

SRS's environmental QA program is conducted to verify the integrity of data generated by onsite and subcontracted environmental laboratories.

The program's objectives are to ensure that samples are representative of the surrounding environment and that analytical results are accurate.

This chapter summarizes the 2005 QA program. Guidelines and applicable standards for the program are referenced in appendix A, "Applicable Guidelines, Standards, and Regulations."

A more complete description of the QA program can be found in *Savannah River Site Environmental Monitoring Program* (WSRC-3Q1-2, Section 1100) and in the *Savannah River Site Environmental Monitoring Section Quality Assurance Plan* (WSRC-3Q1-2, Section 8000).

The 2005 QA data and program reviews demonstrate that the data in this annual report are reliable and meet applicable standards.

QA for EPM

Internal Quality Assurance Program

Laboratory Certification

EPM is certified by the South Carolina Department of Health and Environmental Control (SCDHEC) Office of Laboratory Certification for field pH and total residual chlorine as stated under the Clean Water Act (CWA).

Blind pH Samples

EPM personnel routinely conduct a blind sample program for field measurements of pH to assess the quality and reliability of field data measurements.

During 2005, blind pH field measurements were taken for 24 samples. All field pH measurements except one outlier were within the U.S. Environmental Protection Agency's (EPA's) suggested acceptable control limit of ± 0.4 pH units of the true (known) value. The pH meter for the outlier was recalibrated and the sample was retested. The recalibrated results were within acceptable limits.

Blind Tritium Samples

Blind tritium samples provide an assessment of laboratory sample preparation and counting. During 2005, 12 blind samples were analyzed for tritium; all of the results were within control limits. Complete results can be found in the "Blind Sample Results for Tritium" table on the CD accompanying this report.

QA for EML

Internal QA Program

EML has a documented QA program that meets site and U.S. Department of Energy (DOE) requirements. Instruments are calibrated with known reference standards. Instrument performance is monitored through the use of checks and control charts. Analytical batch performance is measured through the use of quality control (QC) samples (blanks, spikes, tracers, laboratory control samples, and duplicates). QC results that fall outside of specified requirements may result in analytical batch or sample reruns. If a batch or sample is not rerun, the reason is documented in the data package.

Based on periodic inspections of instrument records and analytical data packages, no significant quality assurance issues or corrective actions were identified during 2005.

Laboratory Certification

EML is certified by the SCDHEC Office of Laboratory Certification for the measurement of following analytes:

- total suspended solids and 26 metals (under the Clean Water Act)
- 50 volatile organic compounds (VOCs) and 27 metals (under the Resource Conservation and Recovery Act)

A listing of these metals and VOCs and their reporting limits can be found in the “Nonradiological Environmental Surveillance Practical Quantitation Limits” table on the CD accompanying this report.

External QA Program

In 2005, EML participated in the DOE Mixed Analyte Performance Evaluation Program (MAPEP), an interlaboratory comparison program that tracks performance accuracy and tests the quality of environmental data reported to DOE by its contractors. The Radiological and Environmental Sciences Laboratory (RESL), under the direction of DOE–Headquarters Environmental Safety and Health (ES&H), administers the MAPEP.

MAPEP samples include water, soil, air filter, and vegetation matrices with environmentally important stable inorganic, organic, and radioactive constituents.

In 2005, the analysis of 54 radioisotopes and 14 metals was completed in April for the 13th study set from MAPEP. The analysis of 55 radioisotopes and 15 metals was completed in October for the 14th study set. The results show that the laboratory exceeded the expected 80-percent-acceptable-results level for each study set (table 8–1). The rating was calculated by dividing the acceptable and the acceptable-with-warning results by the total number of results.

MAPEP intercomparison study results for EML can be found in the data tables section of the CD accompanying this report.

QA for Subcontracted Laboratories/EPM Laboratories

Subcontracted environmental laboratories providing analytical services must have a documented QA program and meet the quality requirements defined in the *WSRC Quality Assurance Manual* (WSRC 1Q).

An annual DOE Consolidated Audit Program (DOECAP) evaluation of each subcontracted laboratory

Table 8–1
EML Performance on Mixed-Analyte Performance Evaluation Program (MAPEP)

Study Set	Matrix	EML ^a
MAPEP-05-GrF13	Air Filter	100%
MAPEP-05-GrW13	Water	100%
MAPEP-05-MaS13	Solid	100%
MAPEP-05-MaW13	Water	93% ^b
MAPEP-05-RdF13	Air Filter	100%
MAPEP-05-MaV13	Vegetation	83% ^{c,d}
MAPEP-05-GrF14	Air Filter	100%
MAPEP-05-GrW14	Water	100%
MAPEP-05-MaS14	Solid	100%
MAPEP-05-MaW14	Water	100%
MAPEP-05-RdF14	Air Filter	100%
MAPEP-05-MaV14	Vegetation	100%

^a Column presents the percentage of tests that exceeded the 80%-acceptable-results level.

^b Results for arsenic and mercury were not acceptable.

^c Results for strontium-90 were not acceptable.

^d Results for plutonium-238 were acceptable with warning (bias between 20% and 30%)

is performed to ensure that all the laboratories maintain technical competence and follow the required QA programs. Each evaluation includes an examination of laboratory performance with regard to sample receipt, instrument calibration, analytical procedures, data verification, data reports, records management, nonconformance and corrective actions, and preventive maintenance. Reports of the findings and recommendations are provided to each laboratory, and follow-up evaluations are conducted as necessary. No DOEAP evaluation was conducted for onsite laboratories.

Nonradiological Liquid Effluents

National Pollutant Discharge Elimination System (NPDES) samples are analyzed by three onsite laboratories groups—EML, EPM, and Site Utilities Division (SUD)—and one subcontracted laboratory. All these laboratories must be certified by SCDHEC for NPDES analyses.

Interlaboratory Program

During 2005, all laboratories performing NPDES analyses for WSRC participated in the Environmental Resource Associates (ERA) Water Pollution (WP) performance evaluation studies for compliance with the EPA-required Discharge Monitoring Report—QA Study 25. ERA, as required by EPA, is accredited by the National Institute of Standards and Technology.

SCDHEC uses the study results to certify laboratories for specific analyses. As part of the recertification process, SCDHEC requires that laboratories investigate the outside-acceptance-limit results and implement corrective actions as appropriate.

For the 2005 DMR—QA study, the subcontract laboratory, Shealy Environmental Services (SES), and the onsite laboratories, EPM and EML, participated in the WP 125 and 126 studies, while SUD participated in the WP 125 study.

In the initial WP 125 study, SES reported acceptable results for 12 of 13 NPDES parameters; EPM reported one unacceptable result for one of one parameter; EML reported acceptable results for 10 of 10 parameters; and SUD reported acceptable results for three of three parameters. Complete results can be found in the “Water Pollution Proficiency Testing Studies” table on the CD accompanying this report.

The unacceptable results reported in the WP 125 study were investigated. The initial lead concentration reported by SES was found to be “not acceptable.” The most probable cause for this failure was a low bias by

the instrument. The initial pH concentration reported by EPM was found to be “not acceptable.” The most probable cause for this failure was analyzing the sample directly from the refrigerator without waiting for it to reach room temperature.

All results reported in the WP 126 study were acceptable. As WP 125 corrective actions, SES successfully analyzed lead, and EPM successfully analyzed pH.

During 2005, General Engineering Laboratories, Lionville Laboratory, Inc., and Severn Trent Laboratories, Inc., participated in various WP studies. The results for WP 121 through 127 (table 8–2) show that all the laboratories exceeded the 80-percent-acceptable-results level except Lionville, which reported results for WP 121 and WP 123 at 50-percent and 43-percent acceptable, respectively. In the WP 121 (four results) and WP 123 (seven results) studies, no values fell outside of the warning limits. Future WP study results from Lionville will be monitored—and follow-up corrective action initiated if necessary (table 8–2).

Intralaboratory Program

The environmental monitoring intralaboratory program reviews laboratory performance by analyzing duplicate and blind samples throughout the year.

SES and EML processed 79 duplicate analyses during 2005. Zero-difference results were reported for 48 of these analyses. Three of the 79 duplicate analyses exceeded the relative percent difference range (± 20 -percent difference).

SES and EML processed 82 blind analyses during 2005. Zero-difference results were reported for 45 of these analyses. Three of the 82 blind analyses exceeded the relative percent difference range (± 20 -percent difference). Results for the duplicate and blind sampling programs met expectations, with no indications of consistent problems in the laboratories.

Stream and River Water Quality

SRS’s water quality program requires checks of 10 percent of the samples to verify analytical results. Duplicate grab samples from SRS streams and the Savannah River were analyzed by SES and EML in 2005.

SES and EML processed a total of 258 duplicate analyses during 2005. Zero-difference results were reported for 97 of these duplicate analyses. Thirty of 258 duplicate analyses exceeded the relative percent difference range (± 20 -percent difference).

Table 8–2
Subcontract-Laboratory Performance Environmental Resource Associates (ERA) Water Pollution Studies

Study	General Engineering			Severn Trent			Lionville		
	Acceptable	Warning	Fail	Acceptable	Warning	Fail	Acceptable	Warning	Fail
WP 120	94%	2%	4%				93%	2%	5%
WP 121	100%						50%	50%	
WP 123				83%		17%	43%	57%	
WP 126	84%	2%	14%	93%	3%	3%	90%	4%	6%
WP 127	100%								

Acceptable = Reported value falls within the acceptance limits

Warning = Reported value falls outside acceptance limits but is within warning limits

Fail = Reported value falls outside of the acceptance limits

Most results were within acceptance limits (± 20 -percent difference). Results for the duplicate sampling program met expectations, with no indications of consistent problems with the laboratories. Detailed stream and Savannah River duplicate sample results can be found in the data tables section of the CD accompanying this report.

Groundwater

Groundwater analyses at SRS are performed by subcontracted laboratories. During 2005, General Engineering, Severn Trent, Eberline Services Oak Ridge Lab, and Lionville were the primary subcontractors. MicroSeeps, Inc., was subcontracted to perform special analyses. In addition to the subcontracted laboratories, EML performed analytical analyses on site.

During 2005, Soil and Groundwater Closure Projects (SGCP) subcontract laboratories participated in the MAPEP.

Results from the laboratories are summarized in table 8–3. The results show that all the laboratories exceeded the expected 80-percent-acceptable-results level for both the soil and groundwater matrices.

Soil/Sediment

Environmental investigations of soils and sediments, primarily for RCRA/CERCLA units, are performed by subcontracted laboratories. Data are validated by SGCP according to EPA standards for analytical data quality, and to the degree of scrutiny specified by site customers.

The environmental validation program is based on two EPA guidance documents, *Guidance for the Data Quality Objectives Process for Superfund* (EPA–540–R–93–071) and *Data Quality Objectives Process for Waste Site Investigations* (QA/G–4HW) (EPA–600/R–00–007). These documents identify QA issues to be addressed, but they do not formulate a procedure for how to evaluate these inputs, nor do they propose pass/fail criteria to apply to data and documents. Hence, the validation program necessarily contains elements from—and is influenced by—several other sources, including

- *Guidance on Environmental Data Verification and Data Validation* (QA/G–8), EPA–240/R–02/004
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA–540/R–99/008
- *USEPA Contract Laboratory Program National Functional Guidelines for Chlorinated Dioxin/Furan Data Review*, EPA–540/R–05/001
- *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA–540/R–01/008
- *Test Methods for Evaluating Solid Waste*, EPA, November 1986, SW–846, Third Edition; Latest Update, July 2005
- *DOE Quality Systems for Analytical Services*, Revision 2.1, November 2005

Table 8–3
Subcontract-Laboratory Performance on Mixed-Analyte Performance Evaluation Program (MAPEP)

Study	Matrix	General Engineering	Severn Trent	Eberline	SRS (EML)	Lionville
MAPEP–05–GrW13	Water	100%	100%	100%	100%	No Data
MAPEP–5–MaW13	Water	100%	94% ^{3,6}	94% ¹	93% ^{10,11}	100%
MAPEP–05–OrW13	Water	100%	84%	No Data	No Data	100%
MAPEP–05–MaS13	Solid	90% ^{1,4,a}	94% ^{2,6,7}	100%	100%	97% ²
MAPEP–05–GrW14	Water	100%	100%	100%	100%	No Data
MAPEP–05–MaW14	Water	97% ^b	90% ^{2,6,7}	100%	100%	100%
MAPEP–05–OrW14	Water	100%	100%	No Data	No Data	100%
MAPEP–05–MaS14	Solid	92% ^{1,2,5}	92% ^{1,2}	94% ⁹	100%	100%

¹Results for strontium-90 were not acceptable.

²Results for antimony were not acceptable.

³Results for iron-55 were not acceptable.

⁴Results for selenium were not acceptable.

⁵Results for chromium were not acceptable.

⁶Results for nickel-63 were not acceptable.

⁷Results for uranium-238 were not acceptable.

⁸Results for uranium-233/234 were not acceptable.

⁹Results for technetium-99 were not acceptable.

¹⁰Results for arsenic were not acceptable.

^aResults for chromium were acceptable with warning.

^bResults for plutonium-238 were acceptable with warning.

^cResults for nickel-63 were acceptable with warning.

^dResults for plutonium-239/240 were acceptable with warning.

Many QA parameters are evaluated by automated processing of electronically reported data. Others are selectively evaluated by manual inspection of associated analytical records. A summary of findings is presented in each project narrative or validation report prepared by SGCP personnel.

Data Review

The QA program's detailed data review for groundwater and soil/sediment analyses is described in WSRC–3Q1–2, Section 1100.

In 2005, the major QA issues discovered and addressed in connection with these programs for soil/sediment and groundwater analyses included the following:

- Cyanide analysis without distillation checks at one laboratory
- Gas-flow proportional counting performed without alpha-beta cross-talk calibration at one laboratory

- False positives of total dioxins due to analyte misidentifications of furan internal standards

Previously identified items still being addressed include the following:

- Nitrate-nitrite analysis without reduction checks at one laboratory (this item inadvertently omitted from 2004 report)
- Incomplete record packages for validation
- Omissions and logic failures in electronically reported data

These findings illustrate that, although laboratory procedures are well defined, analytical data quality does benefit from technical scrutiny. A corrective action plan has been put into place to address these issues, which are expected to be resolved during 2006.